three kingdoms, and on the wall immediately above, appears Mr. Dyce's fresco of the Baptism of King Ethelbert. Five other arched compartments remain to be filled up by frescoes. These spaces are at present hung with crimson drapery, powdered with crowns and roses. Around the house, under canopies, between the windows, will be placed statues of all the barons who were instrumental in obtaining the Magna Charta. Artists have been named for the execution of these, and have been applied to for terms.

The soffit of the peeress' gallery, on either side of the house, forms a canopy over the third row of the peers' seats below, and is decorated with the armorial bearings of the various lord chancellors, from the foundation of that office up to the present time.

The brass railing of the gallery is of excellent design, and we should not omit mention of the beautiful brass gates by which the house is entered.

Plain glass at present fills the windows, and will continue to do so for some time to come. The architect has but just now succeeded, after several failures, in obtaining stained-glass to meet his wishes. A sort of standard window has, we believe, been fitted up, and the work will now probably be proceeded with.

The public hall, adjoining, is elaborately decorated, and has a flooring of encaustic tiles. When Mr. Barry last reported, which is now some time ago, there were 1,180 men engaged on the works.

Some account of the mode of heating adopted, will be found in another page.

The new hall and staircase of the British Museum will be opened to the public, it is expected, on Monday next, and workmen are busily occupied in clearing away the scaffolding from the portico, completing the flight of (twelve) steps up to it, gravelling the roadway in front, and finishing the painting inside. Polychromy has been called in to aid the interior effect of this part of the building, and with considerable success, too. The sunk panels are blue with a yellow star in each, the enrichments are variously coloured,—red and white predominating; and the stiles, beams, &c., are covered with frets, guilloche, and scrolls, in flat colours, for all of which precedents have been found in the museum collection. These decorations were executed by Messrs. Collman and Davis. The parapet of the stairs is of carved stone highly polished.

The exterior of the northern wing of the Board of Trade, Whitehall, is fast approaching completion. Report says, that a design to elevate the Horse Guards has been approved by the government. At the Carlton Club, a part of the new façade is up; and the Museum of Economic Geology, described last week, is shewing itself above ground. Mystery still shrouds the proposed addition to Buckingham Palace: rumour speaks of an alteration in the elevation, but we have no certain information concerning it. The public must pay their money before they see the sight; and, instead of commenting in time, with a view to obtain excellence, must be contented with abusing the result, when too late to amend, and sighing grumpily over lost opportunities. When Mr. D'Israeli's new act comes into operation, these things will be better ordered.

"Hang an architect," and all will come right.

PEMBROKE COLLEGE, OXFORD.—A new dining hall is about to be erected at this college according to designs by Mr. Hayward, architect, of Exeter. Mr. M. Arding, of London, is the contractor for the same works.

CHEMISTRY AS APPLIED TO CONSTRUCTION.*

BY PROFESSOR GRIFFITHS.

SULPHATE of lime is a native calcareous compound, presented in considerable abundance, and is of much importance to the architect and the builder; it occurs in various forms, the most common of these being familiarly known as "gypsum," "alabaster," and "plaster stone." Sulphate of lime is a compound of *sulphuric acid*, *lime*, and *water*, these substances being united or held together by a very powerful chemical affinity, and under all ordinary circumstances they manifest no tendency to separate during the lapse of ages; if, however, any variety of this substance be heated red-hot, the water is wholly expelled, whilst dry or anhydrous sulphate of lime remains, and if this be finely powdered and mixed with water, it will combine with the water, and "set" into a solid mass.

From the circumstance of the abundance of gypsum at Montmartre, near Paris, and its heating or calcination being carried on there to a very great extent, the chemically anhydrous sulphate of lime is familiarly known as "plaster of Paris;" its importance in decorative architecture is too well known to need comment. If the "gypsum" or "plaster stone," be heated to a degree beyond that which is simply requisite to expel the water, the resulting "plaster" loses the property of "setting" when mixed with water, because at a high temperature the sulphuric acid and the lime undergo a chemical change, by which a portion of *sulphuret of calcium* is formed. This is a direct union of *sulphur* with *calcium*, and is perfectly different in all its habitudes to the compound of *sulphuric acid* with *lime* or *oxide of calcium*.

"Plaster stone" is rendered anhydrous in two ways: these are technically called "burning" and "boiling;" the former is generally adopted if the plaster be intended for the use of the builder, the latter if for the use of the potter or figure-maker. The "burning" is conducted by heaping lumps of the "raw stone" with fuel; this is generally done at night, that the workmen may the more readily judge when the lumps become fairly red-hot, at which time they are sufficiently "burned," and are successively removed and afterwards ground to powder, which should be kept out of the contact of air and water with the greatest possible care, or it will soon become *hydrated*, and thus lose its property of "setting."

If the "stone" be overheated, parts of it will acquire a yellowish cast, and evolve a sulphureous odour from the formation of *sulphuret of calcium*, and if such carlessly burned plaster be employed, it will either set very imperfectly or cause the work to rise in blisters; a ton of "plaster stone" when well and properly burned generally loses from four to six cwt. of water.

The "boiling" is conducted by grinding the "raw stone" to a fine powder. This is placed in a long brick trough heated by a flue. The water immediately begins to evaporate, and its escape is promoted by constantly stirring the powder, and so abundantly does the water evaporate, that the whole bulk of the powder is agitated, as if it were boiling, hence the origin of the term by which the process is technically known.

If several pounds of good plaster of Paris be mixed with water, a very considerable degree of heat is evolved during the "setting," and this for the same reason as in "slaking" quick-lime, namely the water passing from the liquid to the solid state, and its latent heat thus becoming sensible heat; for the whole "setting" of the plaster depends upon the intense chemical affinity that exists between *anhydrous* sulphate of lime and water, by which the latter is solidified, and every work in plaster owes its hardness, its texture, its durability to such solidification of water.

"Alabaster" is another variety of native hydrated sulphate of lime; and when perfectly white, it may be regarded as chemically pure. Some specimens are beautifully veined, of a rich brown colour, by the presence of peroxide of iron; and common "plaster-stone" invariably contains this substance.

The native varieties of sulphate of lime, namely, "gypsum," "plaster-stone," and "alabaster," are not absolutely insoluble in water, and, therefore, cannot be advantageously employed for works exposed to the weather, for their finely-polished surfaces will very soon become dull and rough from the solvent power of the water that falls upon them; but for internal work, as it is well known, they are almost admirably fitted.

A very simple experiment will prove the solubility of pure white alabaster in water, thus:—dissolve a portion of white soap in strong spirit of wine, to form a clear transparent liquid, called, *tincture of soap*; pour a few drops of this into *distilled water*, and no white curdling will ensue. Place a piece of alabaster in distilled water for a few hours, then remove it, add the tincture of soap, and it will immediately curdle; thus proving that the water has abstracted or dissolved a portion of the alabaster.

Soap is perfectly soluble in pure or distilled water, hence no curdling ensues when added to it; on the other hand, if the water contain sulphate of lime, the soap is immediately decomposed; it is a compound of soda, and fatty or oily matter, and the *lime* immediately combines with such matter, forming an *insoluble* soap, or curd.

The tincture of soap is a very simple and accurate test of the relative purity of water; it is popularly known as "the well-diggers' test," for the *hardness* of spring water generally depends upon the presence of sulphate of lime, derived from the strata of the earth in which the springs originate, or throughout which they percolate.

The blue clay of London abounds with sulphate of lime, in the form of beautiful transparent crystals, known to the mineralogist as *selenite*, and hence most of the well-water of the metropolis is *hard*, and unfit for the purposes of washing.

The crystals of *selenite* consist of forty parts, by weight, of sulphuric acid, twenty-eight parts of lime, and eighteen parts of water; this is readily expelled by heat, and then the actual sulphate remains *anhydrous*, and devoid of regular form or *amorphous*.

Having devoted so large a space to the examination of lime and calcareous compounds, we must terminate here, and proceed to some other important materials employed in construction.

Clay is a most abundant natural production, and enters largely into the composition of many materials employed in architecture. There are many varieties of clay, and these are popularly named after the uses to which they are applied; thus, "brick-clay," "potters' clay," "porcelain clay," and "pipe-clay" are all in universal employment; but these, and other varieties, agree in the character or property of plasticity when mixed with water, and it is on this account that clay is so very valuable to the brick-maker and the potter. The property of plasticity of clay, let the variety of the substance be pure or common, is not destroyed by a large admixture of foreign substances; as, for example, finely powdered flint or finely divided sand; for, in fact, some of "the clay" (as it is called in the potteries) contains only one-fourth its weight of absolutely pure clay, oxide of aluminum or alumina, the remainder being silicious matter; and yet the mass, when mixed with water, or "tempered," admits of being kneaded and formed, either by "throwing or pressing," into various useful articles with the greatest facility.

If clay, or the above toixture, be exposed to a bright red heat, it becomes a solid mass of extreme hardness, and all plasticity is perfectly destroyed; and however finely burnt clay or pottery may be powdered, still it will no longer form a plastic mass when mingled with water.

When chemically examined or analysed, clay appears to be a mixture of pure alumina with several metallic oxides, and is therefore by no means uniform in composition, but every kind of clay contains alumina, or the pure oxide of aluminum in combination with water, and to the water the plasticity of the alumina is entirely referrible.

Clay is the only substance popularly called an earth that has the property of plasticity, hence it is the basis of every kind of earthenware, from common brick to refined porcelain, and "these two extremes include more of the comforts and elegancies of life than are to be found within the chemical range of any other substance."

Pure clay is known in the chemical labora-

* See p. 120, *ante*.